

### **REMARKS**

This paper is submitted in response to the Final Office Action mailed December 29, 2009. A Petition for a three (3) month extension of time is filed herewith. Therefore, the time period for response extends up to and includes June 29, 2010. A Request For Continued Examination (RCE) is filed herewith.

Claims 1–17 and 20–34 are currently pending, with claims 18–19 previously cancelled without prejudice. No new matter is introduced in this Amendment and Response.

Applicants submit the claims are in condition for allowance, and present the following remarks in support thereof.

#### **Rejections under 35 U.S.C. § 103**

1. Claims 1–15, 17, 22–26 and 28–34 were rejected as unpatentable over Preston (GB 2,109,357) in view of Davis et al. (US 4,104,359) in view of Cheng et al. (WO 02/22896). Applicants respectfully traverse the rejection.

Preston describes a method for extracting divalent metal ions from aqueous solutions at pH of 2 to 4 (*see* Preston, at p. 1, ll. 10–12). The method involves using organophosphorus or carboxylic acid in combination with a non-chelating oxime (*see id.*, at p. 1, ll. 38–42). The reference notes that the use of a non-chelating oxime allows the process to be conducted at lower pH (*see id.*, at p. 1, ll. 34–37).

Davis et al. describe a method for regenerating the activity of an oxime (i.e. a ketoxime or an  $\alpha$ -hydroxyoxime in an organic liquid extractant solution used to separate cobalt and nickel from a leach solution (*see generally* Davis, at col. 1, ll. 44–46). The method includes contacting the solution with a salt of a hydroxylamine to regenerate the oxime, which tends to degrade because of the highly acidic nature of the leach or process solution (*see id.*, at col. 1, ll. 56–61).

Cheng et al. describe a method of separating nickel, cobalt or both from other cations contained in a leach solution. The method includes separate solvent extraction steps using an organophosphoric acid, a carboxylic acid and an organophosphinic acid. A wide variety of

carboxylic acids are disclosed. The carboxylic acid extraction step is conducted with a mixture of carboxylic acid and a synergist (such as pyridine carboxylate ester, for example) that is capable of increasing the pH gap between isotherms of nickel and cobalt and manganese and calcium.

Claim 1, from which claims 2-15, 17, 22-26, 28-29 and 34 depend, recites a process for the separation of cobalt and/or manganese from impurities (i.e., calcium or magnesium) in a leach solution. The process includes the step of subjecting the leach solution to solvent extraction using an organic solution of a carboxylic acid, 2-methyl-2-ethyl heptanoic acid, or a cationic exchange extractant with extraction characteristics similar to 2-methyl-2-ethyl heptanoic acid, along with a chelating  $\alpha$ -hydroxyoxime. Claim 30, from which claims 31-33 depend, recites a process for the separation of zinc, copper and cobalt from impurities (i.e., manganese, calcium and magnesium) in a leach solution. The process includes the step of subjecting the leach solution to solvent extraction using an organic solution of a carboxylic acid, 2-methyl-2-ethyl heptanoic acid, or a cationic exchange extractant with extraction characteristics similar to 2-methyl-2-ethyl heptanoic acid, along with a chelating  $\alpha$ -hydroxyoxime.

To make a *prima facie* case of obviousness, the teachings of the prior art should have suggested the claimed subject matter to the person of ordinary skill in the art, and all the claim limitations must be taught or suggested in the references cited by the Examiner. *In re Kotzab*, 217 F.3d 1365, 1370 (Fed. Cir. 2000). As articulated by the Supreme Court in a recent case, a combination is obvious if it is no more than the predictable use of known elements according to their established functions; and there was a reason to combine the known elements. *KSR Intl Co. v. Teleflex, Inc.*, 550 U.S. 398 (2007). To make a *prima facie* case of obviousness, "it remains necessary to identify the reason why a person of ordinary skill in the art would have combined the prior art elements in the manner claimed." *Id.* The initial burden to make a *prima facie* case of obviousness is on the Examiner. *In re Bell*, 991 F.2d 781, 783 (Fed. Cir. 1993). Applicants submit that the Examiner does not make a *prima facie* case of obviousness, because all the limitations of the present claims are not taught by the references cited in the Office Action, either taken alone or in combination.

Applicants respectfully submit that the Examiner has not given sufficient weight to the recitation of term "chelating  $\alpha$ -hydroxyoxime" in present claims. The Examiner contends "the process in Preston uses carboxylic extractants with oximes" and later states that because Preston notes that LIX 93, a chelating hydroxyoxime, is known in the prior art, Preston teaches the use of chelating oximes. Applicants strongly note this contention is contrary to the disclosure in Preston. In fact, Preston specifically describes the combination of carboxylic acid extractants with non-chelating oximes, and does not describe the viable use of carboxylic acid extracting with chelating oximes. The oxime used in the process taught in Preston is a non-chelating oxime, and Preston disparages extraction methods that use chelating oximes. For example, Preston states that "the extraction takes place extremely quickly (of the order of a few minutes, as opposed to some hours in the case of a carboxylic acid and chelating oxime such as LIX 63 mixture)" (see Preston, at p. 1, ll. 59-61). Preston discloses LIX 63 in the examples specifically to demonstrate that LIX 63 gives poor results as an additive with organophosphorus acids. Examples with carboxylic acid extractant solutions used only non-chelating oximes as additives. Therefore, Preston effectively teaches away from the use of chelating oximes in combination with carboxylic acid extractant solutions. A person of skill in the art would not be motivated to modify the teaching of Preston by using a chelating oxime in combination with a carboxylic acid extractant, as such a process would take several hours, as opposed to the shorter time frame (on the order of a few minutes) described in Preston.

Further evidence that Preston teaches away from the use of chelating oximes in the disclosed process is found in the Examples in Preston, which provide that a combination of a phosphoric acid extractant solution and LIX 93 (a chelating oxime) additive is not effective because "extraction of cobalt even is slow and also stripping thereof from the reagent is extremely difficult" (see Preston, at p. 3, ll. 1-2). Applicants submit that a person of skill in the art, knowing that LIX 63 and other chelating oximes have to be avoided in cobalt extraction, would not be motivated to modify the teaching of Preston by using a chelating oxime. The person of skill in the art would not have a reasonable expectation of success in separating cobalt with sufficiently fast stripping kinetics using a chelating oxime when Preston specifically states that extraction of cobalt is slow when a chelating oxime is used. Therefore, as Preston fails to

teach or suggest use of a carboxylic acid extractant solution with a chelating oxime additive, all the limitations of claim 1 are not taught in Preston.

The deficiencies of Preston are not cured by either Davis et al. or Cheng et al. The Examiner contends that it would be obvious to combine Preston with Davis et al. because Davis et al. disclose use of chelating  $\alpha$ -hydroxyoximes in the presence of a stabilizer that would prevent degradation of the oxime. However, there is no disclosure in Davis et al. that use of a chelating oxime can overcome the slow extraction of cobalt or stripping problems identified in Preston. Therefore, the person of skill in the art (reading Preston in view of Davis et al.) would not have been motivated to use a chelating  $\alpha$ -hydroxyoxime in the claimed process – especially since the problem of slow extraction and insufficient stripping kinetics identified in Preston would not be solved by using a chelating oxime with a stabilizer.

With respect to Cheng et al., the Examiner contends that it would have been obvious, in view of Preston and Davis et al., for the person of skill in the art to use 2-methyl-2-ethyl heptanoic acid because Cheng states that carboxylic acids can be used in a metal ion extraction process as in the present claims. Applicants again strongly disagree with this contention. Cheng describes a wide variety of carboxylic acids that can be used in similar extraction processes. However, there is no specific direction in Cheng et al. to choose 2-methyl-2-ethyl heptanoic acid specifically in combination with a chelating  $\alpha$ -hydroxyoxime. To arrive at the process of claim 1, the person of skill in the art would need to make a series of selections. In particular, the person of skill in the art would have to decide to combine a carboxylic acid extractant with a chelating oxime additive, when Preston specifically disparages such a combination. The person of skill in the art would also have to choose a specific carboxylic acid out of the many acids listed in Cheng et al., even though Cheng et al. ascribes no specific import to this particular acid. Without some disclosure in Cheng et al. of a specific combination of acid and oxime producing specific separation of pH isotherms, sufficiently fast separation and sufficient stripping kinetics, the person of skill in the art has no reason to *sua sponte* select 2-methyl-2-ethyl heptanoic acid as the carboxylic acid extractant.

A person of skill in the art would not modify the teaching of Preston by using a carboxylic acid extractant solution in combination with chelating  $\alpha$ -hydroxyoxime additive,

based on the combined disclosures of Davis et al. or Cheng et al. Neither of these references remedies the fact that Preston teaches away from the use of chelating oximes. Therefore, Applicants respectfully submit claim 1 is not *prima facie* obvious over the combination of Preston, Davis et al. and Cheng et al. Withdrawal of the rejection is respectfully requested.

Similarly, claim 30, reciting a process for the separation of zinc, copper and cobalt from impurities (i.e. manganese, calcium and magnesium) in a leach solution, using a carboxylic acid extractant and a chelating oxime additive is not *prima facie* obvious over the cited combination of references, for substantially the same reason as indicated for claim 1.

Claims 2-15, 17, 22-26, 28-29 and 34 depend from claim 1 and incorporate all the limitations thereof. As claim 1 is not *prima facie* obvious over the cited prior art, these claims are also not *prima facie* obvious. Similarly, claims 31-33 depend directly from claim 30 and incorporate all the limitations thereof. Therefore, as claim 30 is not *prima facie* obvious over the cited art, these claims are also not *prima facie* obvious. Withdrawal of the rejection is respectfully requested.

2. Claims 14-16 and 20-21 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Preston in view of Davis et al. in view of Cheng et al., and further in view of Mihaylov (US 5,447,552). Applicants respectfully traverse the rejection.

Claims 14-16 depend from claim 1 and incorporate all the limitations thereof. The above discussion of Preston, Davis et al. and Cheng et al. is incorporated herein in its entirety to avoid duplication. Briefly, the combination of Preston, Davis et al. and Cheng et al. fails to teach or suggest all the limitations of the present claims. Specifically, the combination of references does not teach or suggest a process for extraction of metals from a leach solution using a combination of carboxylic acid extractant and a chelating oxime, as recited in claim 1. Therefore, all the limitations of claims 14-16 are not disclosed in the combination of Preston, Davis et al. and Cheng et al.

The deficiencies of these references are not cured by Mihaylov et al. The reference discloses a process for recovery and separation of nickel and cobalt from an acid leaching solution at a pH of 2 to 6 using a dithiophosphinic acid. However, there is no teaching or

suggestion in Mihaylov of combining a carboxylic acid extractant with a chelating oxime to arrive at the process as in the present claims. Indeed, Mihaylov teaches away from the use of oximes in the disclosed process, noting the tendency of non-chelating oximes to hydrolyze and the kinetic and stripping problems associated with using chelating oximes in extraction (*see* Mihaylov, at col. 2, ll. 13-37).

Applicants further submit that the process recited in the present claims shows unexpected and surprising advantages over the methods described in Preston and Mihaylov et al. In support, Applicants provide herewith a recent paper by the inventor entitled "Solvent extraction of nickel and cobalt with synergistic systems consisting of carboxylic acid and aliphatic hydroxyoxime," *Hydrometallurgy*, 84 (2006): 109-117 (enclosed herewith as Exhibit A). The results of tests described in the paper show that the synergistic solvent extraction process embodied in the present claims gives excellent results that are not predictable from the combination of references cited in the Office Action. For example, as shown in Figure 6, the extraction kinetics of cobalt separation are excellent, with all the cobalt extracted within 30 seconds. Similarly, as shown in Figure 7 of the paper, stripping of cobalt is also very fast, such that within two minutes, over 95% of the cobalt has been stripped. These results are not predictable from the disclosures in Preston and/or Mihaylov (alone or in combination).

Therefore, Mihaylov does not cure the deficiencies of the combination of Preston, Davis et al. and Cheng et al., and claims 14-16 and 20-21 are not *prima facie* obvious over the combination of references cited by the Examiner. Withdrawal of the rejection is respectfully requested.

3. Claim 27 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Preston in view of Davis in view of Cheng, further in view of Dreisinger (WO 98/14623). Applicants respectfully traverse the rejection.

Claim 27 depends from claim 1 and incorporates all the limitations thereof. The above discussion of Preston, Davis et al. and Cheng et al. is incorporated herein in its entirety to avoid duplication. Briefly, the combination of Preston, Davis et al. and Cheng et al. fails to teach or suggest all the limitations of the present claims. Specifically, the combination of references does

not teach or suggest a process for extraction of metals from a leach solution using a combination of carboxylic acid extractant and a chelating oxime, as recited in claim 1. Therefore, all the limitations of claim 27 are not disclosed in the combination of Preston, Davis et al. and Cheng et al.

The deficiencies of these references are not cured by Dreisinger et al. The reference describes a method for extracting copper, cobalt and zinc from an ore that also includes manganese dioxide. The method describes direct leaching in saline of the ore followed by extraction of the metal by solvent extraction methods followed by electrowinning or precipitation (*see* Dreisinger, at p. 1, ll. 10–15). However, there is no teaching or suggestion in Dreisinger of combining a carboxylic acid extractant with a chelating oxime to arrive at the process as recited in claim 1. Therefore, Dreisinger et al. do not disclose all the elements of claim 1. Since claim 27 depends from claim 1, Dreisinger also does not disclose all the elements of claim 27, whether taken alone or in combination with Preston, Davis et al. and Cheng et al.

For at least the above reasons, claim 27 is not *prima facie* obvious over the combination of references cited by the Examiner. Withdrawal of the rejection is respectfully requested.

### **SUMMARY**

In view of the above amendments and remarks, Applicants respectfully request a Notice of Allowance. Applicants do not otherwise concede the correctness of the Examiner's rejections and reserves the right to make additional arguments as may be necessary. If the Examiner believes a telephone conference would advance the prosecution of this application, the Examiner is invited to telephone the undersigned at the below-listed telephone number.

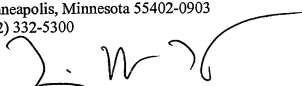
Please consider this a PETITION FOR EXTENSION OF TIME for a sufficient number of months to enter these papers or any future reply, if appropriate. Please charge any additional fees or credit overpayment to Deposit Account No. 13-2725.

Respectfully submitted,

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Date: \_\_\_\_\_

29 June 2010

  
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PATENT TRADEMARK OFFICE